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## Profile of patients subjected for intravenous urography

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### Abstract

In the evaluation of acute flank pain, ultrasonography (US) is limited primarily to pregnant patients. While US demonstrates renal calculi, it is poor at detecting ureteral stones. Doppler sonography has been suggested as a method of indirectly determining obstruction by measuring the resistive index in renal arteries and evaluating the direction and magnitude of ureteral jets. 100 patients of symptoms of unilateral acute renal colic are subjected to Doppler evaluation of control and case kidney and the RI of both kidneys were obtained and delta RI was calculated by difference in RI of case and control kidney. Of 100 patients, 77 were men and 23 were women. The mean age (in years) in men is  $31.36 \pm 11.23$  (17-61) was lower as compared to women  $32.69 \pm 12.55$  (17-65). This difference was not statistically significant (p value 0.6502).

**Keywords:** Intravenous urography, acute renal colic, doppler evaluation

### Introduction

Acute obstructive uropathy is a commonly encountered condition occurring in inpatient and outpatient settings. Unilateral obstruction to urinary outflow typically occurs, with little if any change in measured renal function in a healthy individual. However, the less common bilateral form results in measurable changes in kidney function.

The advent of helical computed tomography (CT) scanning has dramatically altered the diagnostic imaging approach to patients presenting with acute flank pain. Unenhanced helical CT has both a high sensitivity of 95-98% and a high specificity of 96-100% in detecting ureteral calculi in the acute setting<sup>[1]</sup>.

Calcified and non-calcified calculi may be identified, along with the location and size of the stone. Secondary signs of obstructive uropathy, including hydronephrosis, perinephric and periureteral stranding, as well as ureterectasis, are well demonstrated on CT<sup>[2]</sup>.

Several reports compared unenhanced helical CT with intravenous urography (IVU), the established criterion standard in evaluating the genitourinary system. CT has been shown to be more sensitive in detecting and characterizing ureteral calculi and at least as sensitive in demonstrating the presence of obstructive uropathy<sup>[3]</sup>.

Additionally, CT may be performed rapidly, in approximately one third the time of an IVU study, and does not require the use of IV contrast material. The ability to diagnose non-calculusetiologies, as well as evaluate other intra-abdominal pathologies that may mimic renal colic, affords CT an invaluable advantage.

Levine *et al.* reported the sensitivity of plain radiography in detecting ureteral calculi to be approximately 45% and recommended that non-contrast helical CT replace the kidneys, ureters, bladder (KUB) film as the initial and possibly only imaging study. While CT appears to have replaced plain radiography and IVU in the initial evaluation of acute flank pain, these modalities remain involved in the follow-up evaluation of stone disease, as well as surgical and interventional planning<sup>[4]</sup>.

In the evaluation of acute flank pain, ultrasonography (US) is limited primarily to pregnant patients. While US demonstrates renal calculi, it is poor at detecting ureteral stones. Doppler sonography has been suggested as a method of indirectly determining obstruction by measuring the resistive index in renal arteries and evaluating the direction and magnitude of ureteral jets<sup>[5]</sup>. In nuclear medicine, the passage of radionuclide agents through the urinary tract is monitored with a gamma camera.

Outlines of the kidney and ureter are generated, and a point of obstruction may be evident. More importantly, it provides physiologic information regarding the function and dynamics of the urinary system. The technique of choice in the evaluation of obstruction is diuresis renography, which is performed with technetium-99m-labeled mercaptoacetyl triglycine (<sup>99m</sup>Tc-MAG3) in most centers [6].

**Methodology**

100 patients of symptoms of unilateral acute renal colic are subjected to Doppler evaluation of control and case kidney and the RI of both kidneys were obtained and delta RI was calculated by difference in RI of case and control kidney.

Intravenous urography or CT scan are the gold standards for demonstrating obstruction. IVU also used to detect the site and degree of obstruction. The site of obstruction is considered to be proximal, if it is up to or proximal to the L3 vertebral level and distal, if beyond. The degree of obstruction is considered complete in cases with delayed excretions of contrast material and partial in a patient with prompt excretion of contrast. In patients with a non-dilated PCS, increasingly dense nephrogram on IVU or demonstration of calculus on CT, were excluded from the analysis. Patients with surgical or medical renal disease were also excluded from this study. Written consent is obtained in all patients undergoing IVU.

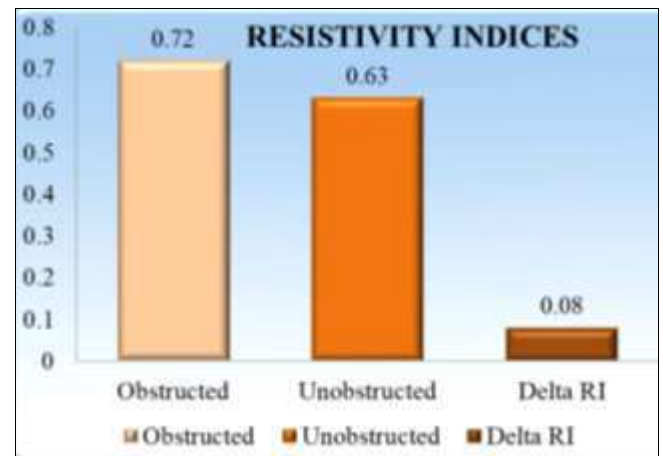
All data was systemically collected. Tabulated and analysed using Microsoft excel strata 6 for Windows. Student t test was used in univariate analysis for continuous variables and Chi square test was used for analysis of non-continuous data. P value of < 0.05 was considered to be statistically significant.

**Results**

In all 100 patients (200 kidneys, 100 obstructed kidneys as cases and 100 unobstructed kidneys as controls) were part of

this analysis. Doppler USG was performed in all cases. IVU in all cases was performed of 100 patients, 77 were men and 23 were women. The mean age (in years) in men is 31.36 ± 11.23 (17 – 61) was lower as compared to women 32.69 ± 12.55 (17 – 65). This difference was not statistically significant (p value; 0.6502).

The mean resistivity index (RI) in obstructed kidneys was significantly higher than in unobstructed kidneys (0.72 Vs 0.63; p<0.001). RI was higher in obstructed kidneys in all cases. The difference in RI between obstructed and unobstructed kidney (delta RI) ranged from 0.03 to 0.15 with a mean delta of 0.08.



**Fig 1:** Resistivity Indices

Most of the patients (54%) were evaluated between 6-12hrs, 26% within 13-18 hrs and 20% within 19-24 hrs after the onset of symptoms. RI values were similar in all three groups. Thus RI was not a time dependent parameter in this study.

**Table 1:** Relationship of Resistivity indices with duration of obstruction

RI Values	6 - 12 Hrs. N= 54	13 - 18 Hrs. N = 26	19 - 24 Hrs. N = 20	P value
Obstructed kidney (RI)	0.72 ± 0.01	0.71 ± 0.01	0.72 ± 0.01	NS
Unobstructed kidney (RI)	0.64 ± 0.02	0.63 ± 0.02	0.63 ± 0.01	NS
Delta RI	0.07 ± 0.02	0.08 ± 0.02	0.08 ± 0.02	NS

**Discussion**

We also analysed the utility of Doppler USG in patients not having dilatation of PCS on USG. Nine patients, who were later confirmed to have obstruction on IVU did not have PCS dilatation on USG. RI values were higher in all these patients, with delta RI of 0.08. Thus, Doppler USG was useful in diagnosing acute renal obstruction even in those cases where PCS dilatation was absent on USG. The sensitivity of USG in detecting PCS dilation in acute obstruction was 77.5% in this study. USG fails to reveal hydronephrosis in acute obstruction of the kidney in up to 35% of cases. C. Roy *et al.* [7] showed that among the study of 65 patients with symptoms of unilateral renal colic, 14 patients without pyelocaliceal dilatation, the sensitivity of duplex Doppler sonography was 70%. The Duplex Doppler sonography was sensitive in indicating obstruction even in patients without pyelocaliceal dilatation.

Discriminatory RI ≥ 0.7 and delta RI of ≥ 0.06 were found to be highly sensitive and specific in this study. Platt JF *et al.* [8] also found a delta RI of ≥ 0.06 to be a useful and accurate diagnostic tool. Haroun Azmi [9] correlated

Urographic findings and duplex Doppler sonography in the 42 patients, with a resistive index = 0.65 and delta resistive index = 0.05 as discriminatory thresholds for obstruction. In patients with complete obstruction, the diagnostic sensitivity of these values was 64% and 100% with a specificity of 82% and 89%, respectively. In patients with partial obstruction, the sensitivity of these values was 54% and 46% with a specificity of 82% and 89%, with respect to the control group of healthy individuals. C. More direct ‘functional’ evidence of obstruction has usually required scintigraphy, but recently, Doppler US techniques have been used to obtain functional information in suspected renal obstruction [10].

**Conclusion**

The role of IVU in our study was to confirm the site and degree of obstruction and also to indicate the functioning status of the kidney.

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